CHAPTER 6
CLASS CONVERSION MODELS AND PROCESSES

6.1 Introduction

Although it is not incumbent upon acquisition managers to understand the intricate details involved in developing an IETM, they should become familiar at a top level with the decision making process required to field an IETM. This section has been extracted from the Draft IETM Process Plan as a guide through the steps to convert legacy data to IETM format or to prepare for a new IETM development program.

6.2 Conversion Decisions

The program decision to convert data, usually from hard-copy to a digital format, involves a commitment of resources to reduce costs and to improve availability, productivity, and quality. Although the IETM CONOPS is generally associated with a new acquisition, many of the issues and decisions confronting a manager are the same for a conversion project.

This section provides information and considerations on converting data from an existing legacy (generally hard-copy or basic word processing format) to an acceptable digital format with functionality that will benefit the user. It also presents a functionality decision model that will assist the cognizant manager in selecting the best conversion model for his or her program. This is the critical first step in developing an IETM CONOPS, which will establish the conditions in which the IETM will be expected to function.

While reading this section, keep in mind that each of the Services is either involved in or has already completed major technical data conversion efforts. These efforts primarily encompass conversion from hard-copy (paper or aperture cards) to either Class I (raster) or Class II (Indexed PDF) formats. Therefore, any conversion required by the program would typically be from one of these formats to a higher level of IETM -- not from the original data format. For example, instead of having to convert from paper to a Class IV IETM, the data would be converted from a Class II to a Class IV IETM with an associated reduction in conversion cost.

Figure 6-1 provides a general overview of the process for converting legacy TMs into IETMs. The decision on what type of IETM to select is critical, as it impacts cost of conversion, functionality available to the user, costs and ability to maintain and update data, ability to interface and interact with other data files, and the ability, cost, and effort to migrate to newer technology. Note that Figure 6-1 represents the IETM phases for conversion to the preferred SGML-based IETM. However, if the data is to be converted to PDF/IPDF (Indexed Portable Document Format) format, the only relevant question is whether the legacy data is in digital or hard-copy format. The two options are:

a. Data in digital format (e.g., ASCII or native file format) - Output directly to PDF format.

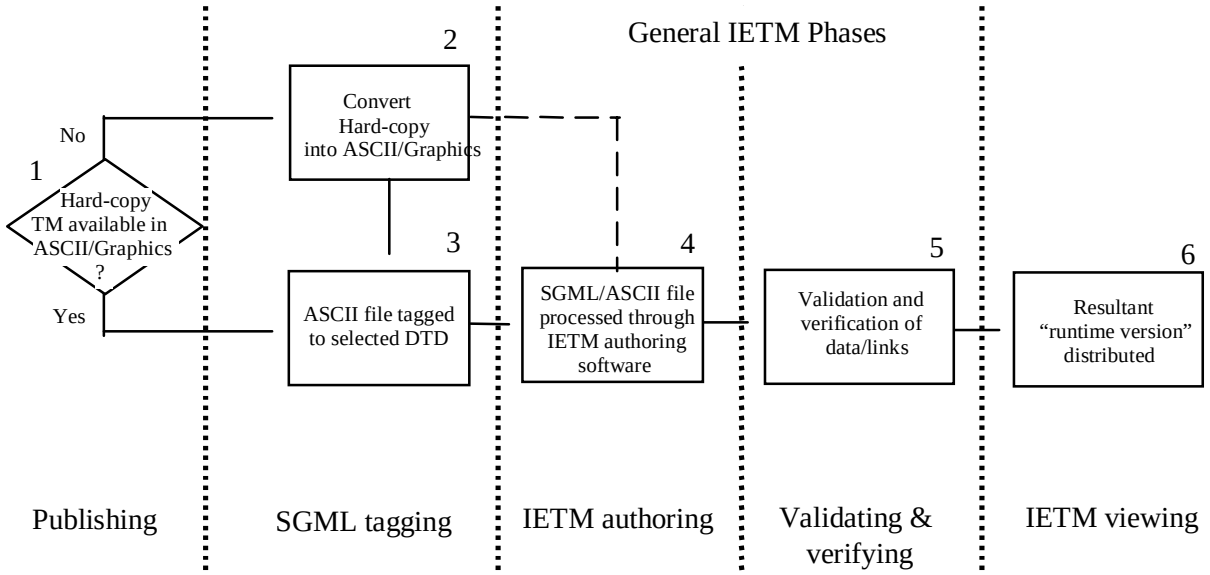

Figure 6-1. IETM Conversion Process

b. Hard-copy - Scan in the data and then run either the Adobe Acrobat Capture program to convert directly to PDF format, or run an Optical Character Recognition (OCR) program to convert it to a format that can be processed (e.g., word-processing). At this point, convert it to PDF/IPDF.

Step 1: If the ASCII file including digital graphics (typically from a publishing or word processing system) of the TM can be obtained, the cost of converting and proofing can be avoided.

Step 2: If ASCII is not available, the existing TMs must be converted from hard-copy into ASCII text using OCR software, and graphics can be taken in various vector or raster formats. In some cases the capability exists to go directly from the ASCII files into the authoring software, as indicated by the dashed line from box 2 to 4 in Figure 6-1 above.

Step 3: When IETM development is contracted out, SGML tagged data should be acquired to provide the program with the benefits described in the CONOPS. Most IETM software tools allow commercial publishing formats to be processed directly through the IETM authoring software. Programs acquiring the data in this manner must be careful not to become locked into a single contractor or vendor product as the only source capable of maintaining the IETM database.

Step 4: The SGML/ASCII data is processed through an “IETM authoring software” to provide the features that the program determined it needs to support its system.

Step 5: Conversion may result in data errors. The data must be re-validated and re-verified to ensure that the converted data file is an accurate representation of the original. Where the conversion is from hard-copy to ASCII, the verification is straight-forward. However, where the conversion includes linking, processing, dividing, re-authoring

or replacing data (e.g., with video), an engineering certification must occur. It will follow the normal TM validation and verification processes.

Step 6: The result of IETM authoring software, a "runtime" version, may be a proprietary file that can be viewed only through vendor proprietary software. To avoid this problem, the acquiring program should obtain an SGML or commercial format file that is compatible with its own TM support infrastructure. There are some IETM viewing software packages that use the native SGML file in the viewer and therefore eliminate any proprietary concerns. Distribution may be on CD, other electronic media or across the Internet.

6.3 Legacy Conversion Processes

6.3.1 Raster Conversion Process

While some conversion from hard-copy to raster may continue to be required to update existing raster manuals, it is being phased out for new conversion efforts.

6.3.2 Service Conversion Efforts

All of the Services are currently involved in the conversion of drawings and documents into digital formats. Descriptions of Air Force, Navy, Army and Marine Corps efforts are provided in Appendices D, E, F and G.

6.3.3 Class II Conversion Model

Figure 6-2 describes the general process involved in converting a hard-copy TM into a Class II IETM. TMs can be converted to Class II from existing legacy hard-copy TMs or they can be acquired as Class II source data from the authoring contractor or Government activity. Acquisition involves a slightly different decision-making process than conversion and is described in detail in Chapter 4 of this document. As with Class I, development processes exists that may relieve the program of many conversion costs.

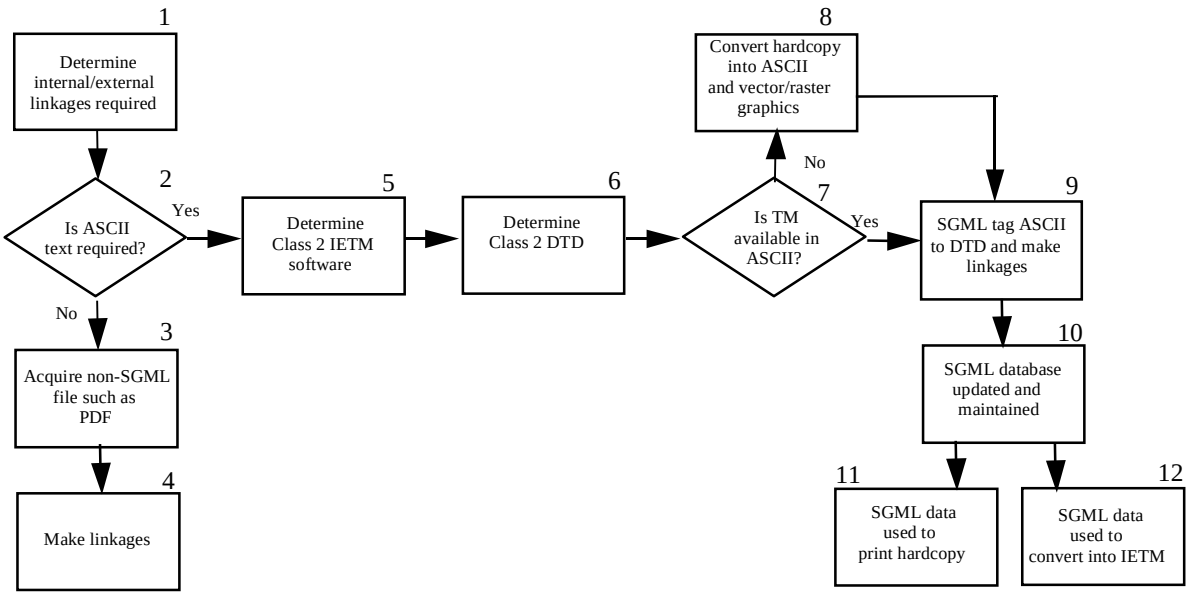

Figure 6-2. Class II IETM Conversion Process

Step 1: Determine required linkages. They enable the user to select a desired item of data by having the IETM locate and present data to the user. The front matter (e.g., table of contents, lists of figures or tables) contains examples of specific items of data linked with their respective location in the body of the IETM. Other examples are: parts lists that can be linked to the IPB; hazardous chemicals that can be linked to warning statements; and textual references that can be linked to tables, figures, and drawings. Evaluate which optional linkages best support the user in accessing information from the IETM. Optional linkages can be initiated by the user selecting an item within the IETM that links to external programs such as audio, video, an expert system or special applications. The CONOPS contains a table that allows the program to identify the type of linkages that are to be applied to a given subject.

Step 2: Is ASCII text required? If the TM has significant change activity, then the cost of an Optical Character Recognition (OCR) can be offset by the savings incurred by updating and changing an ASCII file.

Step 3: If ASCII text is not required, arrange to convert to a non-SGML format such as PDF. This can be further processed into an IETM with the functionality of a Class II IETM by adding an index and hyperlinks. Note that PDF cannot be edited; therefore, the activity producing the PDF file has the only files that can be edited. Programs should always maintain an editing capability by acquiring PDF files with the source files that produced the PDF. PDF files can either be created from the word processing, or other software used to create the original TM; or they can be generated as an output of the scanning process.

Step 4: Incorporate the required and optional linkages determined in Step 1 into the PDF or other selected file format.

Step 5: Determine which software licenses are held at the implementing activity and whether any experts are available to advise on how to properly implement the IETM software. If software has not been licensed for use by the implementing activity, the acquisition of software should be initiated. Chapter 4 outlines the steps to be followed in procuring IETM software.

Step 6: Determine what Document Type Definition (DTD) will be used by evaluating the structure and the content of the data that is to be SGML tagged. DTDs and the software selected must also be compatible. Existing DTDs must be used whenever possible. Appendices D, E, F, and G explain how to obtain those official DTDs that are registered with each Service.

Step 7: Determine the availability of the TM in ASCII and the graphics in raster or vector format.

Step 8: If an ASCII file of the TM does not already exist, the hard-copy TM should be converted into ASCII. The hard-copy graphics should be converted into raster or vector formats depending on whether they need to be modified. Raster graphics can be edited using "draw" programs. Complex or precise drawings become more difficult to raster-edit and benefit from conversion to a vector format using vector graphics software. The cost of converting or redrafting to vector formats may be significant and the use of the software requires more training; but subsequent costs of updating the drawings and graphics will be greatly reduced. Most IETM software tools allow commercial publishing formats to be processed directly through the IETM authoring software. Note that all conversions should be validated or certified by the appropriate authority.

Step 9: The selected DTD and defined linkage requirements can be used to SGML-tag the ASCII and graphic files. Where the SGML-tagged file is to be used to produce the hard-copy TM, any supplemental data that is presented as audio or video enhancements to the IETM must also be tagged and provided for the printed text. Optional linkages must also provide a textual identification of the destination link (e.g., a reference TM, program, database). Paragraph numbers must be consistent in both the hard-copy and IETM to facilitate easy user reference between the two products. If this is done, the SGML file can be processed into a hard-copy publishing system that ignores all audio- and video-tagged files when composing and printing.

Step 10: The resultant SGML-tagged database is the source file. All changes are made to this single source file to keep configuration control as simple as possible. Using the SGML file as the source file requires an SGML authoring system or an SGML input/output filter to an existing publishing system.

Step 11: The SGML data is composed into a publishing system for hard-copy printing. There is no Formatting Output Specification Instance (FOSI) used in this process. The printed hard-copy will contain the same information, but may not have page integrity to the IETM.

Step 12: Foresight in developing the SGML file will allow the same SGML file to be used for both hard-copy printing and electronic display. The SGML file is processed through "IETM authoring software" that produces an IETM runtime file, which is then distributed via CD, other digital media or the Internet.

6.3.4 Class III Conversion Model

The Class III conversion process, Figure 6-3, is the same as the Class II process with one notable difference: Class III IETMs have view packages that enable the viewer to present only selected data from the IETM to the user. It should also be noted that an object-oriented database can be used here without having it integrated into the IETM itself. The creation of view packages is accomplished after the conversion and SGML tagging of the data. As with Class II, foresight must be used in generating the SGML-tagged data to ensure that any audio or video information is represented by text and graphics in the hard-copy TM. Note that PDF files are not currently appropriate for use as Class III IETMs because they cannot utilize view packages.

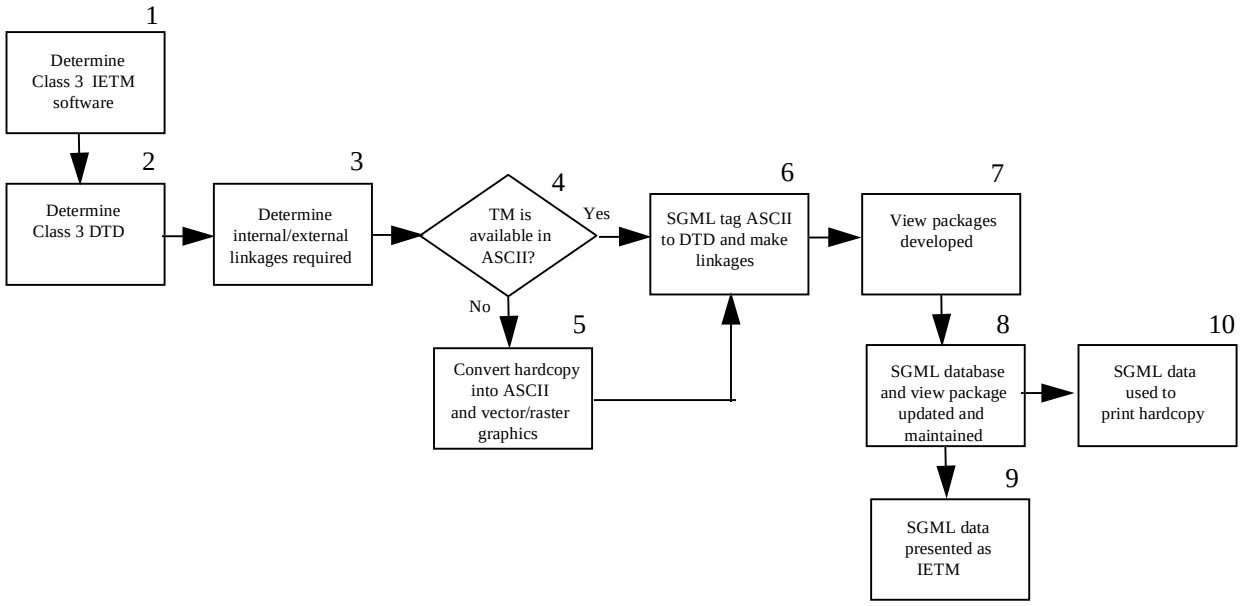

Figure 6-3. Class III IETM Conversion Process

Steps 1-6 Same instructions as the corresponding steps 1-2 and 5-9 found in paragraph 6.3.3 Class II Conversion Model.

Step 7: View packages are developed using IETM software tools.

Step 8: The resultant SGML tagged database is the source file. All changes are made to this single-source file to keep configuration control as simple as possible. Using the SGML file as the source file requires an SGML authoring system or an SGML input/output filter to an existing publishing system. All changes to the source data must be validated to determine whether they affect primary, secondary, or even tertiary linkages in the view packages.

Step 9: Foresight in developing the SGML file will allow the same SGML file to be used for both hard-copy printing and electronic display. The SGML file would be processed through "IETM authoring software" that produces an IETM runtime file. The runtime file, along with other files, is then written to distribution media.

Step 10: The SGML file can be used to print hard-copy TMs by processing it into a publishing system. As the SGML file will have surrogate text and graphics that represent the audio and video material used, the publishing system should be set up to ignore all audio and video tagged files when composing and printing.

6.3.5 Class IV Conversion Model

Figure 6-4 shows the process for converting legacy data into a Class IV revisable database format. While Class IV IETMs provide significant savings in maintaining and updating the data, the costs of conversion are currently high. These costs are due to the re-authoring of the legacy data to take advantage of Class IV functionality. The major costs of conversion are based on the following required tasks:

a. Developing the hierarchical structure
b. Re-authoring the legacy TM to prepare data for use in a database
c. Selecting the level of granularity and indenture for decomposing each section
d. Re-authoring and clean-up to eliminate repetition and redundancy
e. Adding photographs, animations, movies, verbal instructions, and other supplemental enhancements
f. Naming common and unique data objects and linking them into a logical presentation
g. Validating the re-authored information

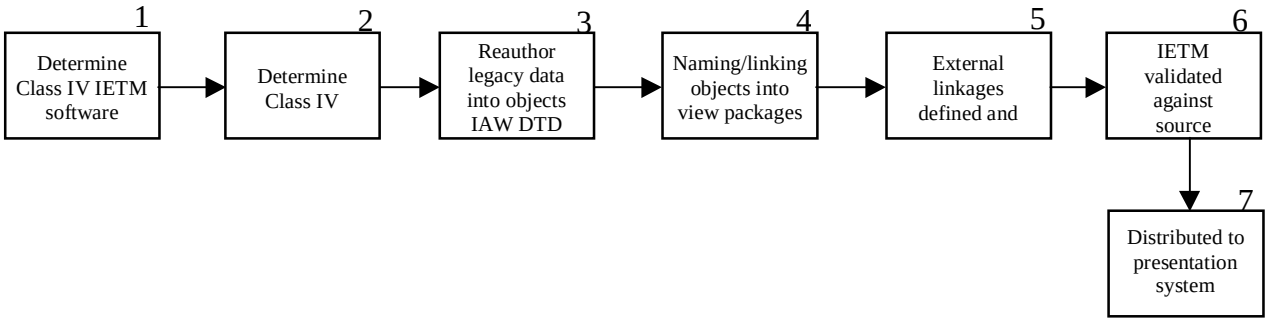

Figure 6-4. Class IV IETM Conversion Process

When Class IV IETMs are created from scratch, the level of indenture and granularity of the data is optimized at the lowest or smallest level (i.e., individual steps). For conversions, the costs of driving all TM data down to this optimal level may be prohibitively high. However, this is not the only logical option. Class IV IETMs can be developed with the objects being roughly the same size as comparable objects in Class III IETMs (e.g., one paragraph or a procedure). By minimizing the handling of the objects and substantially reducing the re-authoring desired or required, the conversion costs can be reduced to the same range as Class III. This IETM would have the presentation features found in a normal Class IV IETM, but would not be as robust. This compromise retains some redundant data, sacrifices some database maintenance efficiency, requires more update effort, and reduces some flexibility. While some of the data may always remain in its initial conversion state, the program has the option of incrementally re-authoring specific sections of the TM (e.g., troubleshooting) down to the appropriate level of indenture (e.g., step). These decisions can be made on the basis of specific maintenance needs, and funds available.

Step 1: Determine what authoring and presentation software licenses are held at the implementing activity. Determine whether experts are available to assist in

implementing the IETM software. If software is not licensed for use by the implementing activity, the acquisition of software should be initiated.

Step 2: Determine the DTD to be used by evaluating the structure and the content of the data to be SGML tagged. Existing DTDs must be used whenever possible.

Step 3: Reauthor source data, creating objects of information in accordance to the selected DTD. Eliminate repeated and redundant data. Create objects and linkages that allow these objects to be referred to many times. Complex or precise drawings become more difficult to raster-edit and would benefit from conversion to a vector format, using vector graphics software. The cost of conversion or redrafting to vector formats may be significant and the use of the software requires more training, but subsequent costs of updating the drawings and graphics will be greatly reduced. Some common hybrid processes allow vector overlays of changes to raster graphics, thereby allowing the use of vector graphic tools and precision without the cost of complete drawing conversion. Note that the appropriate authority must verify all conversions.

Step 4: Name these objects to enable the authors to identify the object subject matter content. The named objects are used to create and tailor presentations (view packages) to subject matter requirements. Tailoring can be done to many presentation criteria such as training, user knowledge levels, system configuration, subject emphasis and overviews.

Step 5: Determine the linkages that best support the user in accessing information from the IETM. Internal linkages enable the user to select a desired item of data and have the IETM locate it from within the IETM data file and present it to the user. Some examples of linkage are: parts lists to the Illustrated Parts Breakdown; chemical names included with warning statements; and text references attached to tables, figures and drawings. Also identify desired external linkages. You can initiate external linkages by selecting an item within the IETM, if the item links to external programs such as audio, video, an expert system or special applications.

Step 6: Have the appropriate authority validate the complete IETM against the source data to ensure that the same content has been conveyed using the Class IV IETM functionality.

Step 7: Once validated, the IETM can be written to the distribution media with associated files as required.

6.3.6 Class V IETM Migration

The formal Class V IETM consists of a Class IV IETM that shares an integrated database with other associated applications. Consideration should be given to the data configuration issues entailed when multiple logistics databases are integrated into a single database. The decision tree in the CONOPS provides the model for determining whether formal Class V functionality is needed.